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Terms of Trade for Developing Countries

A Commodity and Regional Analysis

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Abstract

The terms of trade at which developing countries exchange their agricultural and mineral exports for imported goods vary by commodity and country. Terms of trade for the lowest income developing countries in Asia and Africa (exporters of jute, tea, sisal, and peanuts) deteriorated while the terms of trade for higher income developing countries (exporters of cocoa, coffee, fishmeal, palm oil, and minerals) improved. International programs therefore (like the New International Economic Order) aimed at raising the value of developing countries' exports might be more successful if they concentrate only on specific commodities or specific countries or both, but not on all exports of developing countries, indiscriminately.

Keywords: New International Economic Order; Commodity trade; Developing countries; International trade.

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**Terms Of Trade For Developing
Countries: A Commodity and
Regional Analysis**

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Summary

International programs, like the United Nations' New International Economic Order, aimed at raising the value of developing countries' exports, might be more effective if they concentrated only on specific commodities, the foreign exchange earnings of specific countries, or both.

Such programs are based on the assumption that prices of commodity exports of developing countries tend to decline relative to those countries' imports, causing the developing countries' terms of trade to deteriorate. That assumption, however, seems not to reflect the real state of affairs.

The prices for developing countries' exports did not all move in the same direction between 1960 and 1977, primarily because of the diverse array of commodities exported by developing countries, with each commodity subject to different conditions of supply and demand. Many commodities increased their relative purchasing power relative to manufactured goods and other imports (wheat, beef, and maize, for example), while other commodity exports' purchasing power declined. Cocoa, coffee, sugar, fishmeal, and petroleum and other minerals increased their purchasing power between 1960 and 1977; tea, jute, cotton, and other fibers declined in purchasing power. As a result of different price movements, an analysis of indexes based on prices of specific commodities shows that the terms of trade for some developing countries improved while those of others worsened.

Those findings indicate that international programs that seek to raise the real values of exports of developing countries should concentrate on raising prices of specific commodities whose real prices have declined or on increasing the foreign exchange earnings power of the lowest income developing countries.

The disparity in price movements from 1970 to 1978 worsened the terms of trade for low-income developing countries (gross national product—GNP—of \$200 or less per capita) in Asia and Africa but enhanced the terms of trade for some middle-income (GNP of \$201-\$800 per capita) and high-income developing countries (GNP of \$801 and up per capita) in Asia, Africa, and Latin America, and for petroleum-exporting countries.

Introduction

The terms at which developing countries exchange their agricultural and mineral exports (primary commodities) for imports of manufactures from developed countries may have a longrun tendency to decline. This view, first argued by Prebisch (19, 20) and by Singer (22) asserts that low price and income elasticities of demand for raw materials, the market power of the developed countries, and technical progress in the developing countries tend to bias changes in international terms of trade in favor of the developed countries.¹ As a result, the developing countries, many of which depend on exports of primary commodities for foreign exchange earnings, grow slowly with the gains from trade going to the already well-off developed countries.

Acceptance of the Prebisch-Singer hypothesis as well as the success of the Organization of Petroleum-Exporting Countries (OPEC) in raising prices by cartel action have lead to proposals such as the New International Economic Order (NIEO), advanced through the United Nations Conference on Trade and Development (UNCTAD), to raise commodity prices in real terms (3, p. 147; 23, pp. 20-25; 24, 25). The major objectives of the NIEO include stabilization of international commodity markets and improvement in the real income that developing countries receive from commodity exports. These objectives are to be implemented by establishing international buffer stocks, creating a common fund to finance these stocks, implementing multilateral contracts, and arranging for improved compensatory financing to stabilize export earnings.²

Whether or not developing countries' terms of trade are actually declining is difficult to determine because of the problems in measuring changes in international terms of trade. In addition, most empirical studies refer to the net barter terms of trade, that is, the ratio of export to import prices. An improvement in the terms of trade is assumed to make a country "better off" in terms of national income by providing the opportunity to obtain more imports for a given volume of exports. However, it is well known that a country may increase its productivity in the export sector, thereby decreasing its net barter terms of trade, but still increase its real income.³ Thus it is difficult to infer the economic significance of the measured terms of trade changes. Another problem is that developing countries export different types of primary commodities as well as some

¹ Numbers in parentheses indicate references listed at the end of this report.

² Behrman (1, p. 67) suggests that there are important potential gains for both producing and consuming countries from the proposed integrated program. For critiques of the NIEO proposals, see (5, 13).

³ Brandao (2) points out that changes in terms of trade can affect national income through corresponding changes in interest rates which, in turn, affect investment demand.

manufactured goods. Developing countries also import primary products and different types of manufactures. Thus, it is difficult to infer international terms of trade changes from any aggregate analysis of primary products vs. manufactures.

Deteriorating terms of trade have implications for the ability of developing countries to finance agricultural imports, for U.S. food aid policies, and for the U.S. position in UNCTAD negotiations. In the ensuing pages, I examine the Prebisch-Singer hypothesis of deteriorating terms of trade for developing countries by analyzing trends in prices of primary commodities and industrial products and their impact on the international terms of trade of developing countries. I examined trends in the real prices and volumes of commodity exports of developing countries from 1960-77 and measured changes in international terms of trade for low-income, middle-income, high-income, and petroleum-exporting developing countries in Africa, Asia, and Latin America (see appendix table 1 for the countries in each income group and region). In contrast to other analyses, which aggregated over countries in order to examine trends in international terms of trade, (11, p. 8; 27, p. 35), I found no uniform pattern of terms of trade that applied to all developing countries: some improved their terms of trade while others' terms of trade worsened. The reason for the disparity lay in the diversity of exports, all of which are subject to different market conditions. Such disparity will probably impede the effectiveness of any international trade programs that try to bolster the export prices of all developing countries, without discrimination. Programs that focus more on specific commodities or on specific countries will probably be more successful.

Importance Of Primary Commodity Trade In Developing Countries

Developing countries, it is argued, are particularly harmed by a decline in their terms of trade because of their greater dependence on exports of primary commodities, which have historically experienced weaker market conditions than the exports of developed countries (23, p. 18). Although primary production and trade are important to the economies of developing countries, the developing countries export a variety of primary products, many of which face different market conditions, and they import a variety of products as well (tables 1 and 2).

Production of primary commodities accounts for over 60 percent of the Gross Domestic Product (GDP) earned in the developing countries with the lowest income (table 1). A large percentage of the income earned in producing such commodities was generated by exports (column 2 of

table 1), with the percentage of primary production exported ranging from 11 percent in the low-income Asian countries to 57 percent in the high-income Asian countries. Foreign exchange earnings from primary product exports represented over 80 percent of total merchandise trade, although this percentage varied by region. The relatively lower percentage of primary products in export trade for the low-income Asian countries reflects the importance of cotton and jute textiles in their exports.

Major primary commodity imports and exports of developing countries are shown in table 2. Peanuts and derivative products, cocoa, and coffee are major exports of African countries, whereas the Latin American countries export bananas, cocoa, and coffee, and the Asian countries export cocoa, jute, rubber, and tea. Because of the diversity of primary commodity exports, commodity agreements for specific commodities will not affect the foreign exchange earnings of all developing countries. All the groups of developing countries also imported primary products, particularly wheat, rice, sugar, and maize, which are produced primarily by the developed countries. Import expenditures on primary products (including petroleum) in 1977 were at least 35 percent of total import expenditures for all re-

Table 1 — Developing country primary commodity production and exports, by region and income group, 1977¹

| Region and income group ² | Primary commodity production in gross domestic product | Primary production exported | Foreign exchange from primary products ³ |
|--------------------------------------|--|-----------------------------|---|
| | <i>Percent</i> | | |
| Africa: | | | |
| Low | 60.1 | 25.4 | 92.4 |
| Middle | 57.4 | 43.1 | 92.4 |
| High | 50.0 | 44.0 | 93.1 |
| Latin America: | | | |
| Low | — | — | — |
| Middle | 49.7 | 35.9 | 83.3 |
| High | 34.9 | 40.0 | 81.2 |
| Asia: | | | |
| Low | 61.1 | 11.3 | 75.1 |
| Middle | 55.2 | 40.7 | 91.1 |
| High | 55.4 | 56.8 | 85.7 |

— = Not applicable. As I defined "low income" (see below), Latin America had no low-income countries.

¹Includes oil-exporting countries.

²Income groups: 0-\$200 gross national product (GNP) per capita = low income; \$201-\$800 GNP per capita = middle income; \$801 and up GNP per capita = high income.

³Percentage of merchandise export earnings.

Sources: (8, 1978), World Bank World Development Report, 1979, (26), UNCTAD Basic Data on the Least Developed Countries, 1979.

Table 2 — Primary commodity trade of developing countries by region and income group, 1977

| Region and income group | Major primary commodity exports | Major primary commodity imports ¹ | Import expenditure on primary commodities | | Ratio of major primary import expenditure to export earnings |
|--|--|--|---|--------------------|--|
| | | | Total | Petroleum products | |
| | | | Percent | | |
| Africa: Low | Peanuts, peanut oil, tea, cocoa, coffee, copper, cotton | Wheat, rice, sugar | 38.5 | 10.7 | 12.3 |
| Middle | Cocoa, coffee, copper, peanuts, peanut oil, tea phosphate rock, cotton | Maize, beef and veal, wheat, rice, sugar | 34.5 | 10.9 | 25.3 |
| High | Sugar, copper, tobacco, cotton | Wheat, rice, sugar, beef and veal | 41.5 | 9.3 | 9.1 |
| Latin America: ² Middle | Cotton, coffee bananas, tin | Wheat, rice, maize | 39.5 | 9.6 | 4.3 |
| High | Coffee, sugar, cocoa, copper, bananas, cotton, soybeans, maize, iron ore | Wheat, maize, rice, coffee, rubber, iron ore | 40.6 | 15.5 | 20.2 |
| Asia: Low | Jute, rubber, tea, rice, cotton | Wheat, rice, cotton | 55.5 | 16.0 | 50.8 |
| Middle | Coffee, rice, sugar, copra, coconut oil | Wheat, sugar, rice, cotton | 46.4 | 15.0 | 42.2 |
| High | Rubber, palm oil, tin | Wheat, rice, sugar, maize, cotton | 42.1 | 13.5 | 51.7 |
| Petroleum-exporting countries ³ | Petroleum, rubber, cocoa, bananas | Sugar, wheat, rice, tea, rubber, beef and veal | 42.0 | 8.5 | 3.4 |

¹Excluding petroleum. ²As 1 defined "low income." Latin America had no low-income countries. ³See appendix table 1 for list of oil-exporting countries. Sources: (8, 1978; 11, 1979; 26, 1979).

gions and income levels. Low-income Asian countries spent over 50 percent of their export earnings from their major primary product exports on their major imported primary commodities (excluding petroleum). This indicates that their foreign exchange situation could be improved by international programs that lowered the prices of their primary commodity imports as well as by programs that raised the prices of their exports.

Empirical Measurement Of International Terms Of Trade

Although the proponents of the NIEO argue that the developing countries have experienced a longrun worsening of their terms of trade, their argument is not supported by empirical evidence. Kindleberger found no clear trend in the terms of trade of primary vs. manufactured goods and suggested that the large dispersion among countries and products in the price indexes made any aggregate analysis almost meaningless (12). Montgomery found improvement rather than deterioration in international terms of trade for primary products (17). Lipsey examined the terms of trade for the United States from 1879-1960 and found that, although there were large swings, no longrun trend emerged (16). Lipsey's analysis indicated that the U.S. terms of trade did increase steadily (hence the LDC's terms of trade deteriorated) from 1951-1960.⁴

Porter found a generally falling trend for 46 commodity prices between 1947 and 1962 (21), supporting the findings of Lipsey. Haberler pointed out, however, that the decline in primary prices during this period was not the beginning of a trend, but the U.S. reaction to high prices during the Korean War and massive U.S. stockpiling during and immediately after the war (10, p. 56). Porter found, contrary to the Prebisch thesis, that demand for primary products typically may be price inelastic or very income elastic, but not both. Thus, a fall in the price of a primary product, reducing the exporter's foreign exchange earnings, could be offset by increased demand for the product caused by economic growth in the rest of the world.

On the theoretical as well as the empirical front, Lewis argued that, in order to analyze the change in terms of trade between tropical products and manufactured goods, the problem must be broken into two ratios—the tropicals:wheat ratio and the wheat:manufactures ratio (15). The price of manufactures in developed countries, according to Lewis, is determined by the opportunity cost of resources in food so that an increase in produc-

⁴Lipsey's study also did not confirm the belief that other industrial countries had enjoyed large improvements in their terms of trade since the 1870's (16, p. 17).

tivity in food production in developed countries would increase the relative price of manufactures in terms of food and in terms of tropical products. The reason tropical countries experienced declines in net barter terms of trade in 1965, Lewis argued, was because the world price of wheat had risen less than the price of manufactures, due to increases in U.S. agricultural productivity.

Aggregate international terms of trade statistics calculated by the World Bank show the terms of trade for all developing countries improving since the midsixties (11, p. 8). The World Bank terms of trade statistics are calculated as unit value indexes of exports from all developing countries divided by unit value indexes of imports. The terms of trade for developed countries and for petroleum-importing developing countries, however, exhibited mild parallel fluctuations during the same period. These results indicate the importance of petroleum in calculating aggregate terms of trade indexes and that all countries have suffered from the high petroleum prices set by OPEC.

Discussion of international terms of trade revolves around four concepts:

- Net barter or commodity terms of trade, defined as the ratio of import to export prices.
- Income terms of trade, defined as the product of the net barter terms of trade and the quantity of exports.
- Gross barter terms of trade, defined as the ratio of the quantity of exports to the quantity of imports.
- Double factorial terms of trade, defined as the ratio of the net barter terms of trade and the relative change in productivity in a country's export sector compared with the productivity in foreign industries that produce its imports.

Lipsey argued that the double-factoral terms of trade should be used to measure the welfare impact of a change in the terms of trade because this concept measures the purchasing power per unit of input and, thus, takes into account changes in productivity (16). When "the terms of trade" are mentioned hereafter without further qualification, we are referring to the net barter or commodity terms of trade.

Three measurement problems have been identified in measuring changes in international terms of trade: changes in the composition of exports and

imports, failure to account for quality changes, and the choice of an index to measure changes in the terms of trade (2, pp. 63-74). Changes in the composition of exports and imports affect the numerical value of the indexes used to summarize terms of trade behavior. Commodities that were not traded in the base year of the index may eventually become important whereas goods previously traded may become less important or disappear from trade. A fixed-weight index does not take into account changes in the mix of products traded. At the same time, a change in a current-weighted price index may represent nothing more than a change in the mix of products, with prices of individual commodities remaining constant. The choice of index determines whether the change in product mix is accounted for or not.

Terms of trade indexes that fail to account for quality changes in imports over time tend to understate the gains of primary product exporters. The quality of industrial goods tends to improve over time while the quality of primary products does not. Thus, increased prices of manufactured goods relative to primary products may reflect nothing more than quality changes.⁵

The selection of an index is related to the choice of base year as well as the choice of weights, which can create an upward or downward bias to the average change in prices that actually occurred. The choice of a base year with extremely high (or low) prices will create a downward (or upward) bias to all terms of trade changes. In addition, indexes based on beginning year weights tend to have an upward bias compared with price indexes based on current or end-year weights if the changes in prices and quantities are negatively correlated.

I accounted for the first and third problems by estimating price indexes with fixed weights (Laspeyres index) and variable weights (Paasche index) and then comparing the results. The base years I chose were also assumed to represent "normal" trade years. I ignored the second problem because of difficulties in measuring quality changes over time. The question of price indexes is addressed again in a later section.

Price and Quantity Trends, 1960-77

I examined the volume traded as well as price trends for 33 commodities exported by developing countries and three groups of industrial products

⁵The problem of quality change and construction of price indexes has been treated by Griliches (9). This problem is usually ignored in constructing price indexes because of data problems.

imported by developing countries. Price changes can give rise to a volume change that offsets movements in price. For instance, a price rise caused by short supplies may sufficiently reduce the volume exported to offset the price gain. Similarly, a decline in net barter terms of trade, resulting in a larger increase in volume exported due to growth or productivity change in the exporting country, will increase the foreign exchange earnings supplied by the exported commodity. Thus, the impact of a change in terms of trade on the economy of a country also depends upon the accompanying changes in export volume.

Price Trends

Table 3 provides annual average growth rates of unit values for the 33 export commodities and three groups of industrial products for two periods, 1960-1972 and 1960-77 (1977 being the most recent year in which data on mineral exports and manufactured goods imports are available), in nominal terms and deflated by the price indexes of manufactured goods imported by developing countries. The growth rate for each commodity is the ratio of the annual increase in price (estimated from a linear time trend) to the mean value of price over the respective periods. The products analyzed provided about 70 percent of the value of developing countries' exports from 1975-77 and 83 percent of developed country exports to developing countries (27, p. xxxii). I used unit values (total value of imports or exports divided by total quantity of imports or exports) instead of market prices because international market price quotations for some commodities may not accurately reflect the actual values realized by exporters or importers. Unit values for imports as well as exports are expressed free on board (f.o.b.). Consequently, the net barter terms of trade in table 3 are pure merchandise terms of trade and do not reflect changes in costs of transportation and insurance. I estimated trends for two periods in order to account for the abnormally high prices during the commodity price boom of 1973-74.⁶ Unit value indexes for the industrial products are Paasche type, current-weighted, with 1970 as the base year (27).

All 33 primary commodities and the three groups of industrial products nominally increased in price from 1960-77. Ten primary commodities and the chemicals index declined in price over the 1960-72 period, which does not include the abnormally high commodity prices of the later period. Trends in export unit values, deflated by the three unit value indexes for industrial products, show that many of the commodities that increased in value in nominal terms actually declined in value in "real terms." Thirteen

⁶The base year chosen for the trends could impose upward or downward bias if the base year is an unusual year.

Table 3 — Unit value trends for 36 commodities, nominal and deflated, 1960-77

| Commodity | Unit value trend | | Unit value/chemicals trend | | Unit value/machinery trend | | Unit value/others trend | |
|-----------------------------------|------------------|---------|----------------------------|---------|----------------------------|---------|-------------------------|---------|
| | 1960-72 | 1960-77 | 1960-72 | 1960-77 | 1960-72 | 1960-77 | 1960-72 | 1960-77 |
| <i>Percent change¹</i> | | | | | | | | |
| Agricultural exports: | | | | | | | | |
| Bananas | 0.91* | 2.77* | 0.16* | -1.20 | -1.34 | -2.96* | 0 | -0.68* |
| Beef | 7.42* | 7.00* | .80* | 3.25* | 4.64* | 1.69 | .86* | 4.13* |
| Cocoa | 3.06* | 8.57* | .39* | 4.67* | .81 | 2.74 | 0.51 | 5.23* |
| Coconut oil | .45 | 4.89* | 1.26 | .50 | -1.53 | -1.04 | -1.11 | 1.56 |
| Coffee | 2.12* | 8.39* | .28* | 3.93* | -.26 | 1.74 | .01* | 4.13* |
| Copra | -.08 | 3.89* | .08 | -.53 | -2.06 | -1.79 | 0 | .59 |
| Cotton | 1.02* | 5.46* | 1.77* | .99* | -1.44* | -.85 | .33 | 1.74* |
| Fishmeal | 5.23* | 9.38* | 5.81* | 4.80* | 2.76* | 3.21* | 4.62* | 5.69* |
| Jute | .05 | 1.25 | .85 | -2.41* | -2.38 | -4.33* | -.66 | -.22* |
| Linseed oil | -2.32* | 7.23* | -1.46* | 1.92 | -4.52* | .30 | 2.95* | 3.29 |
| Maize | 1.36* | 6.18* | .20* | 1.72* | -.95 | -.02 | 0 | 2.65* |
| Palm oil | -.59 | 5.60* | .16 | .93 | -2.94* | -.81 | -1.18 | 1.95 |
| Peanuts | 2.14* | 7.40* | 2.87* | 3.04* | -.44 | 1.21* | 1.44 | 3.92* |
| Peanut oil | .55 | 6.19* | 1.29* | 1.58* | -1.93* | -.17 | -.11 | 2.57* |
| Rice | 1.66 | 7.40 | .24 | 2.95 | -.26 | 3.09 | 1.26 | 5.63 |
| Rubber | -5.75* | 1.30 | -4.81* | -3.13* | -7.78* | -5.15* | -6.37* | -2.60* |
| Sisal | -5.5* | 5.27* | -4.79* | .05 | -7.58* | -1.50 | -6.14* | .04* |
| Soybeans | 1.88* | 7.48* | 2.59* | 2.83* | -.61 | .98 | 1.20 | 3.62* |
| Sugar | 2.13* | 8.51* | .27* | 3.63* | -.39 | 2.23 | .01 | 5.16* |
| Tea | -2.77 | .67 | -.20* | -3.36* | -4.92* | -5.31 | 0 | -3.07* |

See footnote at end of table.

Continued—

Table 3 — Unit value trends for 36 commodities, nominal and deflated, 1960-77 (Continued)

| Commodity | Unit value trend | | Unit value/chemicals trend | | Unit value/machinery trend | | Unit value/others trend | |
|-----------------------------------|------------------|---------|----------------------------|---------|----------------------------|---------|-------------------------|---------|
| | 1960-72 | 1960-77 | 1960-72 | 1960-77 | 1960-72 | 1960-77 | 1960-72 | 1960-77 |
| <i>Percent change¹</i> | | | | | | | | |
| Agricultural exports, continued: | | | | | | | | |
| Timber | .26 | 5.31* | .86* | .84 | -1.93* | -1.17* | -.38 | 1.40 |
| Tobacco | .97 | 4.39* | 1.71* | .13 | -1.60* | -1.82* | .24 | .69 |
| Wheat | .36 | 5.77* | .10* | 1.27* | -2.10* | -.44 | 0 | 2.32 |
| Wool | -3.54* | 2.38 | -2.78* | -1.92* | -5.67* | -3.73* | -4.20* | -1.09 |
| Mineral exports: | | | | | | | | |
| Bauxite | 2.06* | 5.11* | 3.00* | 1.01 | -.27 | -.94* | 1.41* | .85* |
| Copper | 6.49* | .51* | 7.03* | 1.41 | 4.33* | .03 | 5.88* | 2.25 |
| Iron ore | -1.62* | 2.58* | -.82* | -1.79* | -3.87* | -3.74* | -2.28* | -1.34* |
| Lead | 3.33* | 7.31* | 4.01* | 2.64* | 1.07 | 1.08 | 2.72* | 3.65* |
| Manganese ore | -3.74* | 3.67* | -2.89* | -1.36 | -5.93* | -3.31* | -4.41* | -.76 |
| Petroleum | 1.66* | 14.92* | 2.38* | 9.62* | -.92* | 3.22* | .94 | 10.58* |
| Phosphate rock | -1.24 | 10.20* | 4.89 | 4.82* | -2.46* | 2.94 | -.87* | 6.29* |
| Tin | 3.93* | 8.18* | 4.54* | 3.29* | 1.68 | 1.60* | 3.34* | 4.07* |
| Zinc | 4.11* | 10.91* | 4.73* | 5.85* | 1.65 | 4.16* | 3.48* | 6.72* |
| Manufactured imports: | | | | | | | | |
| Chemicals | -.78* | 4.79* | — | — | — | — | — | — |
| Machinery | 2.56* | 7.63* | — | — | — | — | — | — |
| Others | .66* | 4.00* | — | — | — | — | — | — |

— = Not applicable.

*Significantly different from zero at a 5-percent level of significance.

¹Estimated from a linear trend.

Sources: (11, 27).

commodities increased in value relative to industrial products: beef, cocoa, coffee, copper, fishmeal, lead, peanuts, petroleum, phosphate rock, rice, soybeans, tin, and zinc. All other primary commodities declined in value relative to industrial products. Table 3 shows that the developing countries whose imports were concentrated in machinery items suffered the largest decline in the real value of their exports. In 1977, 58 percent of total manufactured exports to developing countries were machinery items (27, p. xxxii).

In addition to the price changes of commodity exports compared with manufactures, import prices of staple commodities increased relative to the prices of several export commodities, namely, tea, jute, rubber, bananas, copra, tobacco, and coconut oil during the 1960-77 period (table 4). Countries dependent on exports of these products, for example, the low-income Asian countries, experienced a decline in the purchasing power of their exports relative to staple imports as well as a decline relative to manufactured imports. Any gains, therefore, received by suppliers of these staple commodities were at the expense of importers.

The largest average rates of growth in prices for all 36 commodities were for cocoa, coffee, fishmeal, rice, sugar, petroleum, zinc, and tin. The distribution of exports of these and other primary commodities among developing countries is shown in table 5. Commodities with the highest increase in prices benefitted mainly the high- and middle-income developing country groups. High coffee prices increased the export purchasing power of the Latin American countries and middle-income African countries that export coffee. Similarly, high cocoa prices raised the export purchasing power of the middle-income African and high-income Latin American countries that export cocoa. Petroleum, tin, and sugar are also exported mainly by the higher income developing countries.

Increases in rice prices between 1960 and 1977 largely affected the middle-income Asian countries that export rice (Thailand, for example) and, to some extent, the low-income Asian and high-income Latin American countries. It should also be noted that there is not much international trade in rice, compared with production, so that small variations in rice supplies tend to cause relatively larger price changes. Declining prices for tea, jute, and sisal (1960-72) largely affected the low-income Asian and African exporters.

Quantity Trends

Rising export volumes for commodities such as cocoa, coffee, maize, sugar, beef, bananas, soybeans, vegetable oils, rubber, tobacco, timber,

Table 4 — Unit values of selected primary exports deflated by unit values of imported staple products, 1960-78

| Export commodity | Wheat | | Maize | | Sugar | | Beef | | Rice | |
|-----------------------------|-----------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| | 1960-72 | 1960-78 | 1960-72 | 1960-78 | 1960-72 | 1960-78 | 1960-72 | 1960-78 | 1960-72 | 1960-78 |
| | <i>Percent change¹</i> | | | | | | | | | |
| Bananas | 1.23* | -2.07* | -0.46 | -2.12* | -0.06 | -5.44* | 2.72* | -2.21* | -.74* | -3.00* |
| Cocoa | 2.79* | 6.12* | 1.33 | 6.24* | 2.16 | 1.80 | -.41 | 6.57* | 1.36 | 3.90 |
| Coconut oil | .66 | -1.42 | -.87 | -.22 | .04 | -3.75* | -2.62* | -.06 | -1.10* | -1.89* |
| Coffee | 2.34* | 4.22* | 7.46 | 4.38* | .90 | -.05 | -1.50 | 4.54* | .56 | 2.64 |
| Copper ² | 6.13* | .58 | 5.21* | .06 | 4.36* | -1.12 | .29 | -1.65 | 5.25* | -.08 |
| Copra | .12 | -1.02 | -1.46 | -.98 | -.62 | -4.40* | -3.41* | -.85 | -1.84* | -2.23* |
| Cotton | 1.24* | .08 | -.42 | .12 | -.37 | -3.73 | -2.69* | .98 | -1.04 | -1.28* |
| Jute | .26 | -3.42* | -1.66 | -3.59* | -1.73 | -6.68* | -3.98* | 3.98* | -3.44 | -4.89* |
| Palm oil | -.40 | .50 | -2.00* | .57 | -2.00 | -3.53* | -3.88* | .79 | -3.43* | -1.11* |
| Peanuts | 2.17* | 2.99* | .60 | 3.11* | .11 | -1.24 | -1.55* | 3.24* | .57 | .36 |
| Peanut oil | .73 | 1.01 | -.90 | 1.08 | -.89 | 3.03* | -2.99* | 1.36 | -2.34* | -1.50* |
| Petroleum | 1.23* | 9.12* | .14 | 8.21 | -.71 | 6.30 | -5.63* | 7.51* | .09 | 6.84* |
| Phosphate rock ² | -4.97 | 3.41* | -1.66* | 2.92* | -2.30 | 5.42 | -6.64* | 2.09 | -1.99* | .99 |
| Rubber | -6.11 | -2.55 | -7.75* | -2.61* | -7.61 | -5.92* | -9.47* | -2.74* | -10.08* | -5.23* |
| Tea | -2.98* | -3.62* | -4.69* | -3.77* | -4.46 | -6.84* | -6.86* | -4.05* | -4.98* | -7.86* |
| Tin ² | 3.56* | 2.79* | 2.68* | 3.07* | 1.87 | .58 | -2.44* | .59 | 2.78* | 1.08 |
| Tobacco | 1.20* | -.27* | -.51 | -.28 | -.67 | -4.01* | -2.94* | -.33 | -2.06 | -2.67* |

*Significantly different from zero at a 5-percent level of significance.

¹Estimated from a linear trend.²Percent changes for 1960-77.

Sources: (11, 8).

Table 5 — Developing country share of world commodity exports by region and regional income level, 1977¹

| Commodity | Africa | | | Asia | | | Latin America | | |
|----------------|----------------|--------|------|-------|--------|-------|---------------|-------|-------|
| | Low | Middle | High | Low | Middle | High | Middle | High | Total |
| | <i>Percent</i> | | | | | | | | |
| Sisal | 26.88 | 21.50 | 0 | 0 | 0 | 0 | 1.12 | 47.75 | 97.2 |
| Copra | 3.00 | 1.16 | 0 | .09 | 286.50 | 35.54 | .03 | .01 | 96.4 |
| Rubber | .68 | 3.74 | .48 | 4.66 | 34.22 | 52.43 | .01 | .01 | 96.2 |
| Jute | 0 | 0 | 0 | 81.75 | 12.68 | .22 | 0 | .03 | 94.7 |
| Cocoa | 1.24 | 63.67 | 0 | .17 | 2.88 | 1.66 | 2.31 | 22.23 | 94.2 |
| Coffee | 7.33 | 21.32 | 0 | 1.67 | 6.51 | .15 | 24.28 | 29.74 | 91.0 |
| Bananas | .93 | 3.39 | 0 | .05 | 7.77 | .20 | 35.60 | 38.84 | 86.8 |
| Petroleum | 0 | 6.90 | 7.10 | 0 | 4.30 | 61.70 | .50 | 5.50 | 86.0 |
| Palm oil | .92 | 4.38 | 0 | 0 | 17.07 | 60.22 | .07 | .07 | 82.7 |
| Tin | 1.93 | 1.65 | .15 | 1.05 | 21.71 | 39.77 | 14.93 | 1.31 | 82.5 |
| Bauxite | .84 | 25.92 | 0 | .08 | 1.22 | .72 | 2.50 | 47.13 | 78.4 |
| Tea | 3.44 | 9.17 | .33 | 52.92 | 6.37 | .48 | .06 | 2.20 | 75.0 |
| Peanut oil | 3.78 | 41.18 | 0 | 0 | .10 | .02 | 0 | 28.70 | 73.7 |
| Coconut oil | .46 | .08 | .06 | .75 | 68.02 | 2.83 | .04 | .01 | 72.2 |
| Linseed oil | 0 | 0 | 0 | .47 | 0 | 0 | 0 | 66.28 | 66.8 |
| Phosphate rock | 0 | 45.90 | 5.50 | 0 | 48.99 | 3.23 | 0 | .13 | 63.8 |
| Copper | 9.28 | 14.23 | 1.01 | 0 | 8.45 | .36 | 0 | 22.87 | 56.9 |
| Peanuts | 11.97 | 23.91 | 0 | 0 | 1.57 | .95 | .02 | 7.20 | 56.2 |
| Cotton | 3.67 | 17.81 | .89 | 0 | .03 | 9.07 | 7.39 | 8.43 | 49.7 |
| Sugar | .37 | .69 | 5.34 | .83 | 11.53 | 4.80 | 2.04 | 21.97 | 47.6 |
| Rice | .25 | 1.90 | 0 | 8.49 | 18.07 | 3.67 | .66 | 6.67 | 39.7 |

¹Income levels are defined as follows: low income = 0-\$200 gross national product (GNP) per capita; middle income = \$201-\$800 GNP per capita; high income = \$801 and up GNP per capita. Includes petroleum-exporting countries.

²Includes New Hebrides, Solomon Islands, Tonga.

³Includes Gilbert Islands, New Caledonia, Pacific Islands, Western Samoa.

⁴Includes Nauru, Christmas Islands, and Ocean Islands.

Sources: (8, 11, 29).

and several minerals, accompanied by price increases (table 3), allowed countries dependent on their exports to increase their nominal export earnings from these commodities between 1960 and 1977 (table 6). Declines in export volume for rice and fishmeal partially offset their price gains. Exports of vegetable and animal fibers (jute, sisal, wool, and cotton) declined during the period due, in part, to competition from synthetic

Table 6 — Export volume and values, 36 commodities, 1960-77

| Commodity | Volume | | Value | |
|-----------------------------------|---------|---------|---------|---------|
| | 1960-72 | 1960-77 | 1960-72 | 1960-77 |
| <i>Percent change¹</i> | | | | |
| Agricultural exports: | | | | |
| Bananas | 4.86* | 3.61* | 8.60* | 7.07* |
| Beef | 4.24* | .69* | 7.52* | 7.39* |
| Cocoa | 1.54* | .55 | 19.41* | 12.41* |
| Coconut oil | 6.61* | 6.96* | 19.90* | 13.10* |
| Coffee | 1.49* | 1.33* | 17.82* | 11.32* |
| Copra | -3.56* | -4.22* | 1.88 | 0 |
| Cotton | 2.07* | -.21 | 6.95* | 5.03* |
| Fishmeal | -7.56 | -.13 | -1.64 | 3.54 |
| Jute | -.80* | -2.66* | -4.17* | 2.25* |
| Linseed oil | -4.38* | -3.09* | 12.68* | 4.57* |
| Maize | 7.31* | 4.11* | 11.01* | 9.74* |
| Palm oil | 5.40* | 8.78* | 25.88* | 16.09* |
| Peanuts | -3.65* | -5.28* | 2.89 | 1.08 |
| Peanut oil | 2.78* | 2.07* | 13.08* | 8.70* |
| Rice | -1.70* | -.88 | 16.78 | 12.00 |
| Rubber | 2.93 | 3.45* | 12.10* | 7.11* |
| Sisal | -1.04* | -3.52* | -4.56* | .20* |
| Soybeans | 21.46* | 21.41* | 36.01* | 23.05* |
| Sugar | 2.30* | 3.14* | 19.43* | 12.56* |
| Tea | 1.70* | 1.94* | 8.44* | 4.31* |
| Timber | 9.43* | 7.10* | 10.43* | 9.58* |
| Tobacco | 3.16* | 4.32* | 14.17* | 8.98* |
| Wheat | -2.36 | .30 | 9.63* | 5.24* |
| Wool | -1.63 | -2.64 | 4.29* | .74 |
| Mineral exports: | | | | |
| Bauxite | 3.94* | 3.56* | 6.59 | 6.22* |
| Copper | 3.20* | 3.79* | 2.46 | 5.87* |
| Iron ore | 7.48* | 5.87* | 6.37 | 6.43* |
| Lead | .39 | -1.37* | 2.61 | 3.24 |
| Manganese ore | 3.82* | 1.39* | 4.11 | 2.90 |
| Petroleum | 10.25* | 7.94* | 25.06* | 17.49* |
| Phosphate rock | .03* | 4.89* | 15.74 | 11.94* |
| Tin | 1.82* | .69 | 6.25 | 6.11* |
| Zinc | 2.84* | 2.26* | 13.81* | 10.52* |
| Manufactured imports: | | | | |
| Chemicals | 9.22* | 8.88* | 8.80* | 13.12* |
| Machinery | 7.20* | 8.22* | 9.90* | 13.65* |
| Others | 5.36* | 6.78* | 6.50* | 12.95* |

*Significantly different from zero at a 5-percent level of significance.

¹Estimated from a linear trend.

Sources: (11, 8, 27).

fibers. The declines in exports of jute and wool, which are larger than the price increases of 1960-77, indicate a decline in export earnings over this period.

Shift in Supply Schedules of Primary Products

The shifts in the supply curves for traded commodities implied by the estimated unit value and trade volume trends can be derived assuming the supply function is divisible into two parts, a long-term component and a short-term component (21).⁷ The trend level of quantity supplied (S_i) is assumed equal to the trend level of the quantity traded (Q_i). The trend level of quantity supplied can be written as a function of the trend level of own price and the trend level of the price of supply substitutes:

$$S_i = Q_i = f_i(P_i, P_s, t) \quad (1)$$

where the variables in the supply function (f_i) represent time (t), trend level of own price (P_i), and the trend level of the price of close supply substitutes (P_s). Time is included so that a rate of longrun shift of the supply curve for given prices can be calculated. Differentiating equation (1) with respect to time (t) yields

$$\hat{Q}_i = \alpha + \epsilon(\hat{P}_i - \hat{P}_s) \quad (2)$$

where \hat{Q}_i , \hat{P}_i , \hat{P}_s are estimated trend rates of change of the quantity of the i th product, of the commodity's own price, and price of supply substitutes, respectively, ϵ is the supply price elasticity, and α is a measure of the rate of longrun shift of the supply curve (see 21 for a derivation of this equation). At any given price trend and supply price elasticity, α is proportional to the rate of downward or upward shift of the supply curve.⁸ Thus α is proportional to factors that shift the supply curve such as productivity change, government policies, etc.

Solving (2) for α yields a relation between longrun rate of shift of supply (α) and the longrun supply price elasticity (ϵ)

$$\alpha = \hat{Q}_i - \epsilon(\hat{P}_i - \hat{P}_s) \quad (3)$$

⁷Porter measured shifts in the supply curve of 46 primary commodities from 1947 to 1962 (21).

⁸Alpha (α) is the partial derivative of the function f_i with respect to time divided by the trend level of quantity supplied (Q_i).

I assume that, for all commodities, the own price and cross-price supply elasticities are equal. This is equivalent to the assumption that an equiproportional increase in \hat{P}_i and \hat{P}_s causes no change in supply. Estimates of α for assumed ϵ values of 1 and 2 are shown in table 7. These estimates are calculated on the assumption that \hat{P}_s is 5.77, the median percent price increase for the 33 primary commodities. The median price is used because of a lack of specific knowledge of all relevant substitutes. Where price trends of the relevant substitutes are in fact greater (or less) than the median, the value of α will be biased downward (or upward). The use of the median, however, should prevent consistent bias over the 33 products.

Table 7 — Rate of shift in supply curves for 33 commodities, 1960-77

| Commodity | Values of α | |
|-----------------------|--------------------|----------------|
| | $\epsilon = 1$ | $\epsilon = 2$ |
| <i>Percent change</i> | | |
| Agricultural exports: | | |
| Soybeans | 19.70 | 17.99 |
| Palm oil | 8.95 | 9.12 |
| Rubber | 7.92 | 12.39 |
| Coconut oil | 7.84 | 8.72 |
| Timber | 7.56 | 8.02 |
| Tea | 6.74 | 12.14 |
| Bananas | 6.61 | 9.61 |
| Tobacco | 5.70 | 7.08 |
| Jute | 1.86 | 6.38 |
| Peanut oil | 1.65 | 1.23 |
| Wool | .75 | 4.14 |
| Sugar | .40 | -2.34 |
| Wheat | .30 | .30 |
| Cotton | .10 | .41 |
| Beef | -.54 | -1.77 |
| Coffee | -1.29 | -3.91 |
| Cocoa | -2.25 | -5.05 |
| Copra | -2.34 | -.46 |
| Rice | -2.51 | -4.14 |
| Sisal | -3.02 | -2.52 |
| Maize | -3.40 | 3.29 |
| Fishmeal | -3.74 | -7.35 |
| Linseed oil | -4.55 | -6.01 |
| Peanuts | -6.91 | -8.54 |
| Mineral exports: | | |
| Iron ore | 9.06 | 12.25 |
| Copper | 9.05 | 14.31 |
| Bauxite | 4.22 | 4.88 |
| Manganese | 3.49 | 5.59 |
| Phosphate rock | .46 | -3.97 |
| Petroleum | -1.21 | -10.36 |
| Tin | -1.72 | -4.13 |
| Zinc | -2.88 | -8.02 |
| Lead | -2.91 | -4.45 |

The implication of any other assumed supply price elasticity may be easily estimated since the relationship is linear.⁹

It is important to note in table 7 that commodities exported by developing countries with relatively large average percentage increases in prices from 1960-77 (sugar, coffee, cocoa, fishmeal, beef, sisal, and rice—table 3) experienced upward (negative) rates of shift in their supply schedules as defined by the elasticities and estimated price and volume trends. This phenomenon can also be inferred from tables 3 and 6. Despite more rapid rates of price increase for these commodities, the quantities supplied generally increased at a slower pace which, for any supply price elasticity, implies a lower rate of shift in the supply curve compared with other commodities. The mean rates of price and quantity change for these seven commodities were 8 percent and 0.3 percent, respectively, from 1960 to 1977. Five mineral commodities (petroleum, phosphate rock, tin, lead, and zinc) also had negative estimated rates of shift in their supply schedules. The mean values of price and quantity changes for these commodities were 10 percent and 3 percent, respectively.

The largest positive rate of shift in supply, equal to 20 percent at $\epsilon = 1$ and 18 percent at $\epsilon = 2$, was for soybeans. This result is due to the fact that, although soybean prices increased over the estimation period, the quantity supplied by developing countries (primarily Brazil) increased at a faster rate. Positive values of α were also obtained for peanut, palm, and coconut oils, which compete with soybean oil as final products.¹⁰ The mean values of changes in prices and quantities for these commodities were 6 percent and 10 percent, respectively.

Timber, tobacco, maize, wheat, and cotton also have positive values of α , but lower increases in prices than the above commodities. The mean changes in prices and quantities for these commodities were 5.4 percent and 3.1 percent, respectively. Positive values of α result because the price changes of these commodities are generally below the median price which, at any supply price elasticity, implies a positive rate of shift in the supply curve. Mean changes in prices and quantities for tea, jute, wool, rubber, and bananas were 1.6 percent and 0.8 percent, respectively.

⁹ If α is assumed equal to zero, the estimate of α is simply the trend rate of change of quantity. It can be argued that in the very long run, primary product supply elasticities tend to be much higher than those derived in the text. Elasticities of 1 and 2 were also used in (21).

¹⁰ Negative values of α for copra and peanuts could indicate a shift from export of the raw product to export of refined products, oil and meal. This is the case for Senegal, one of the larger exporters of peanuts and derivative products, which ceased to export peanuts in the early seventies.

The foregoing results indicate that increases in prices of cocoa, coffee, rice, sugar, beef, sisal, and some minerals from 1960 to 1977 were associated with restrictions in supply of one form or another. These restrictions were due, in part, to government policies that managed supplies or to lower production. Five of these commodities, cocoa, coffee, sugar, petroleum, and tin, were subject to international agreements of one form or another to control quantities traded during this period.¹¹

Lower price increases for commodity exports such as jute, tea, bananas, rubber, and wool were associated with policies or events that increased supplies over time. This result could be due to productivity increases in the exporting countries or to government policies, which shifted the supply curve downward over time. To the extent that productivity increased, these exporters may be "better off" in that more imports could be purchased per unit of input employed in the production of the export commodity.¹² For other commodities, in which productivity did not increase, supply management policies that raise the export earnings of export commodities could benefit the relevant developing countries. However, the extent to which this is possible depends upon the relevant market structures and demand elasticities of the commodities involved.¹³

International Terms of Trade Indexes, 1970-78

Individual price changes analyzed in the previous section affect the terms of trade and the foreign exchange position of developing countries depending upon the weights associated with individual commodities in the external trade of each country. In this section I derived international terms of trade indexes for primary commodity exports and imports of developing countries disaggregated by region and income level. I first described the export price indexes calculated and the methodology for construction. I constructed import price indexes for industrial products by weighting the individual price indexes for chemicals, manufactures, and other products by shares in individual country trade (26, 27). I provided net barter terms of trade for developing countries' commodity exports in relation to import

¹¹Edwards argues that the ability of coffee-producing nations to maintain high prices is due to the oligopolistic nature of this market, dominated by a few large producing nations (7).

¹²This explanation applies to soybeans as Brazil emerged as a major exporter during this period.

¹³Brook, Grilli, and Waelbroeck suggested that price stabilization programs could benefit (in terms of income) exporters of cocoa, coffee, jute, wool, and wheat (4).

prices of manufactured goods, wheat, and petroleum as well as aggregate income terms of trade for each regional group of developing countries.

Export Price Indexes

Export indexes presented in table 8 are Fisher's Ideal price and quantity indexes based on commodity export unit values of 35 commodities and nine groups of developing country groups. The 35 commodities include the 33 analyzed previously plus oilseed meals and jute textiles. Export price indexes for 1978 were estimated by using linear trends to estimate export unit values and quantities for mineral products. The indexes use 1970 as the base year. Paasche and Laspeyres indexes were an intermediate product in the computation of the Fisher indexes using the formula:¹⁴

$$FI = \sqrt{\frac{\sum P_n Q_o}{\sum P_o Q_o} \cdot \frac{\sum P_n Q_n}{\sum P_o Q_n}} \quad (4)$$

where P_o and Q_o are price and quantity in the base year, P_n is price in the given year, $PI = \sum P_n Q_n / \sum P_o Q_n$ is the formula for the Paasche index, and $LI = \sum P_n Q_o / \sum P_o Q_o$ is the formula for the Laspeyres index. The Fisher's Ideal index is preferred to the simple Laspeyres and Paasche indexes because it compensates for the opposing tendencies toward bias in the Laspeyres and Paasche approaches (see below) by averaging the two.¹⁵

Table 8 shows that the average of export prices for the middle-income and high-income African countries, and the Latin American countries increased more (on a 1970 base) than the average of export prices for the lower income countries in Asia and Africa. However, the quantity indexes indicate that relatively low increases in export prices for low-income African and middle-income Asian countries were offset by increasing export volumes (compared with 1970 volumes). Low-income Asian countries experienced declines in export volume, with the exception of two years, in addition to relatively smaller increases in export prices. This indicates that these countries' primary export earnings grew less than those of other developing countries. This result is probably due to concentration of these

¹⁴ Quantity indexes are obtained by switching the subscripts on P and Q in each index.

¹⁵ Fisher's Ideal index also satisfies the weak factor reversal test where $P_{ij}Q_{ij} = P^iQ^i$, P_{ij} is the Fisher Ideal price index, Q_{ij} is the Fisher quantity index, and P^rQ^r equals total expenditure in time r .

Table 8 — Fisher price and quantity indexes, 1970-78

| Region and income group | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 ¹ |
|---|-------|-------|-------|-------|-------|-------|-------|-------------------|
| <i>Fisher price indexes (1970 = 100)</i> | | | | | | | | |
| Africa: | | | | | | | | |
| Low income | 88.3 | 94.1 | 124.9 | 162.7 | 136.4 | 164.8 | 207.9 | 193.4 |
| Middle income | 92.8 | 95.0 | 129.1 | 195.8 | 181.4 | 204.3 | 263.3 | 275.4 |
| High income | 105.2 | 117.5 | 136.5 | 234.7 | 270.0 | 234.0 | 240.8 | 257.3 |
| Asia: | | | | | | | | |
| Low income | 102.7 | 109.0 | 116.5 | 154.4 | 172.4 | 151.5 | 186.1 | 191.2 |
| Middle income | 85.3 | 84.1 | 129.3 | 196.2 | 152.9 | 141.7 | 152.1 | 165.1 |
| High income | 99.1 | 104.5 | 155.9 | 224.3 | 185.5 | 222.6 | 248.2 | 273.4 |
| Latin America: | | | | | | | | |
| Middle income | 94.3 | 99.1 | 128.4 | 167.4 | 165.2 | 220.4 | 332.5 | 303.7 |
| High income | 96.2 | 107.0 | 148.7 | 194.3 | 187.7 | 201.9 | 232.2 | 229.0 |
| Petroleum exporters | 121.1 | 132.6 | 182.0 | 599.1 | 633.5 | 640.1 | 787.8 | 850.1 |
| <i>Fisher quantity indexes (1970 = 100)</i> | | | | | | | | |
| Africa: | | | | | | | | |
| Low income | 101.7 | 104.4 | 116.6 | 112.1 | 110.9 | 128.6 | 103.4 | 115.6 |
| Middle income | 91.5 | 100.6 | 103.3 | 99.9 | 93.5 | 110.5 | 90.7 | 87.9 |
| High income | 98.1 | 114.8 | 127.5 | 122.1 | 105.8 | 120.0 | 116.5 | 115.1 |
| Asia: | | | | | | | | |
| Low income | 98.7 | 99.0 | 103.3 | 96.1 | 102.1 | 116.6 | 100.7 | 97.1 |
| Middle income | 114.6 | 119.5 | 113.7 | 116.2 | 115.5 | 163.0 | 180.0 | 137.2 |
| High income | 94.8 | 95.0 | 107.9 | 97.6 | 98.3 | 132.4 | 114.5 | 120.2 |
| Latin America: | | | | | | | | |
| Middle income | 94.9 | 113.0 | 105.7 | 95.4 | 111.5 | 103.2 | 98.2 | 112.7 |
| High income | 95.3 | 100.9 | 99.7 | 99.5 | 97.8 | 102.2 | 106.9 | 103.9 |
| Petroleum exporters | 99.7 | 96.1 | 146.6 | 133.6 | 120.0 | 139.0 | 125.3 | 136.1 |

¹Estimated.

Sources: (8, 11, 18, 28, 29).

countries' export commodities in tea and jute, products with less growth in demand in the 1960-77 period.

Paasche and Laspeyres price indexes are of interest because differences in the two indexes show the relationship between price and quantity changes (table 9). Both indexes are averages of identical commodity price ratios in each developing country group which differ only in the weights assigned to each. The Laspeyres indexes assign base year (1970) quantity weights to the price relatives, whereas the Paasche index assigns given-year quantity weights. The Paasche index thus gives more weight than the Laspeyres to commodities that increased in quantity relative to the average. A Laspeyres index higher than the Paasche index indicates a shift in quantity toward commodities that fell in price. If the Paasche index is higher, there was a shift in quantity toward those commodities that rose in price. A higher Laspeyres index suggests that substitution (or changes in supply conditions) were of predominant importance over the period, while a higher

Paasche index implies that changes on the demand side were a stronger influence (16, pp. 85-86).

Four regional income groups of developing countries had increasing trends in the ratios of Laspeyres to Paasche price indexes (for example, Laspeyres price indexes are larger than the Paasche indexes) over the 1970-78 period. These groups are the low- and high-income African countries, middle-income Asian countries, and middle-income Latin American countries (table 9). The positive trends indicate the substitution effects that would be expected on theoretical grounds, that is, a shift in consumption toward commodities with smaller price increases. The negative price-quantity relationships indicate that changes in supply conditions for the relevant commodities were more predominant than demand changes over the period. The middle-income Asian countries (dominated by the Philippines and Thailand) experienced the largest increase in export supply as indicated by the Fisher's Ideal export quantity index. These countries also experienced relatively small increases in export prices.

Table 9 — Laspeyres and Paasche export price indexes, 1970-78

| Region and income group | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 |
|---|-------|-------|-------|-------|-------|-------|-------|-------|
| <i>Laspeyres price indexes (1970 = 100)</i> | | | | | | | | |
| Africa: | | | | | | | | |
| Low income | 88.4 | 93.8 | 126.6 | 169.6 | 140.5 | 171.9 | 225.4 | 209.7 |
| Middle income | 92.3 | 94.6 | 128.4 | 193.3 | 178.7 | 183.5 | 259.4 | 252.9 |
| High income | 105.8 | 119.1 | 139.5 | 246.6 | 292.0 | 247.4 | 250.4 | 266.8 |
| Asia: | | | | | | | | |
| Low income | 103.5 | 109.5 | 116.0 | 155.9 | 169.6 | 147.3 | 186.5 | 190.5 |
| Middle income | 85.8 | 85.3 | 131.0 | 199.1 | 151.9 | 152.6 | 164.5 | 202.3 |
| High income | 98.5 | 104.2 | 153.8 | 221.9 | 178.4 | 213.2 | 246.5 | 259.4 |
| Latin America: | | | | | | | | |
| Middle income | 94.6 | 98.8 | 128.1 | 175.3 | 171.6 | 226.5 | 345.0 | 314.7 |
| High income | 97.2 | 105.9 | 150.0 | 191.2 | 182.2 | 199.2 | 235.7 | 217.2 |
| Petroleum exporters | 121.2 | 132.7 | 181.5 | 598.7 | 634.4 | 639.2 | 695.3 | 853.2 |
| <i>Paasche price indexes (1970 = 100)</i> | | | | | | | | |
| Africa: | | | | | | | | |
| Low income | 88.2 | 94.4 | 123.1 | 156.0 | 132.4 | 157.9 | 191.7 | 178.3 |
| Middle income | 93.2 | 95.5 | 129.8 | 198.3 | 184.1 | 227.5 | 267.2 | 300.0 |
| High income | 104.6 | 115.9 | 133.6 | 223.4 | 249.7 | 221.3 | 231.5 | 248.2 |
| Asia: | | | | | | | | |
| Low income | 101.9 | 108.5 | 117.0 | 153.0 | 175.2 | 155.8 | 185.7 | 191.9 |
| Middle income | 84.7 | 82.9 | 127.6 | 193.4 | 153.8 | 131.6 | 140.6 | 134.7 |
| High income | 99.7 | 104.9 | 158.1 | 226.7 | 192.9 | 232.4 | 250.0 | 288.1 |
| Latin America: | | | | | | | | |
| Middle income | 94.0 | 99.4 | 128.7 | 160.0 | 159.1 | 214.4 | 320.5 | 293.1 |
| High income | 95.2 | 108.1 | 147.4 | 197.5 | 193.5 | 204.6 | 228.8 | 241.6 |
| Petroleum exporters | 121.1 | 132.4 | 182.6 | 599.5 | 632.6 | 641.0 | 892.5 | 847.0 |

Sources: (8, 11, 18, 28, 29).

Two groups of developing countries, middle-income African and high-income Asian countries, exhibit a declining trend in the Laspeyres to Paasche price index ratio, which indicates positive correlation between price and quantity. The main influence on this relationship found in the high-income Asian countries (dominated by Malaysia) appears to be increases in demand for exports of palm oil, petroleum, timber, and rubber. The positive correlation between price and quantity in products exported by middle-income African countries appears to be due, primarily, to increases in demand for mineral products, for example, phosphate rock, bauxite, and petroleum.

Paasche price indexes greater than Laspeyres price indexes since 1971 for the high-income Latin American countries are due to increases in demand for soybeans exported by Brazil, which emerged as a major exporter in this period. Paasche price indexes greater than Laspeyres indexes since 1974 for the petroleum-exporting countries are due to increases in demand for petroleum. Paasche and Laspeyres export price indexes for the low-income Asian countries are relatively close in value which indicates more stable demand (and supply) for the exports from these countries, primarily jute and tea.

International Terms of Trade

Net barter terms of trade of primary exports (Fisher's Ideal price indexes) to manufactured imports, petroleum, and wheat prices for nine regional income groups are shown in table 10. Import price indexes for manufactured goods were obtained by weighting unit value indexes for chemicals, machinery, and other manufactured goods by the percentage of each in the total imports of manufactured goods of each country from 1975 to 1977. The unit value indexes are Paasche indexes and are expressed f.o.b. They may understate the true costs of manufactured goods by omitting costs of transportation and insurance.¹⁶ The import values of wheat and petroleum are cost plus insurance and freight (c.i.f.) and thus include the effects of changes in costs from transport and insurance.

Net barter terms of trade changed for developing country depending upon the countries and import commodity examined. All developing countries suffered a decline in the terms at which their primary product exports exchange for petroleum imports. Higher prices for petroleum products are obviously the result of the success of the Organization of Petroleum-Exporting Countries in setting international prices of oil by restricting the

¹⁶ Failure to include transportation and insurance charges will not affect the results provided that these costs did not change over time.

Table 10 — International terms of trade, primary commodity exports for petroleum, manufactured goods, and wheat imports, 1970-78

| Region and income group | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 ¹ |
|---|-------|-------|-------|-------|-------|-------|-------|-------------------|
| <i>Petroleum terms of trade (1970 = 100)</i> | | | | | | | | |
| Africa: | | | | | | | | |
| Low income | 66.4 | 67.8 | 69.8 | 28.2 | 21.7 | 24.6 | 28.3 | 23.9 |
| Middle income | 69.8 | 68.5 | 72.2 | 33.9 | 28.9 | 30.5 | 35.9 | 34.0 |
| High income | 79.1 | 84.7 | 76.3 | 40.7 | 43.0 | 34.9 | 32.8 | 31.8 |
| Asia: | | | | | | | | |
| Low income | 77.2 | 78.5 | 65.1 | 26.8 | 27.5 | 22.6 | 25.4 | 23.6 |
| Middle income | 64.1 | 60.6 | 72.3 | 34.0 | 24.3 | 21.1 | 20.7 | 20.4 |
| High income | 74.6 | 75.3 | 87.2 | 38.9 | 29.5 | 33.2 | 33.8 | 33.8 |
| Latin America: | | | | | | | | |
| Middle income | 71.0 | 71.4 | 71.8 | 29.0 | 26.3 | 32.9 | 45.3 | 37.5 |
| High income | 72.4 | 77.1 | 83.1 | 33.7 | 29.9 | 30.1 | 31.6 | 28.3 |
| <i>Manufactures terms of trade (1970 = 100)</i> | | | | | | | | |
| Africa: | | | | | | | | |
| Low income | 82.5 | 80.4 | 88.5 | 91.9 | 67.2 | 81.5 | 95.8 | 80.5 |
| Middle income | 86.7 | 80.5 | 90.9 | 110.6 | 89.3 | 100.1 | 120.7 | 114.7 |
| High income | 98.3 | 100.4 | 96.8 | 131.8 | 133.0 | 115.8 | 111.4 | 107.2 |
| Asia: | | | | | | | | |
| Low income | 96.0 | 94.0 | 82.6 | 84.8 | 84.1 | 75.0 | 86.1 | 79.6 |
| Middle income | 78.9 | 70.7 | 90.4 | 110.8 | 74.9 | 69.1 | 69.1 | 68.8 |
| High income | 91.8 | 87.8 | 109.8 | 126.7 | 91.4 | 108.6 | 112.8 | 113.9 |
| Latin America: | | | | | | | | |
| Middle income | 88.1 | 84.7 | 91.0 | 92.0 | 80.6 | 108.5 | 153.2 | 126.5 |
| High income | 89.9 | 91.4 | 105.4 | 107.3 | 92.0 | 99.4 | 107.0 | 95.4 |
| Petroleum exporters | 111.1 | 110.5 | 127.3 | 346.3 | 313.6 | 310.7 | 354.8 | 354.2 |
| <i>Wheat terms of trade (1970 = 100)</i> | | | | | | | | |
| Africa: | | | | | | | | |
| Low income | 84.7 | 89.8 | 73.4 | 58.0 | 49.0 | 68.0 | 99.6 | 90.0 |
| Middle income | 89.0 | 90.7 | 75.9 | 69.8 | 65.1 | 84.3 | 126.2 | 128.2 |
| High income | 101.0 | 112.2 | 80.3 | 83.7 | 97.0 | 96.6 | 115.4 | 119.7 |
| Asia: | | | | | | | | |
| Low income | 98.6 | 104.1 | 68.5 | 55.0 | 61.9 | 62.5 | 89.2 | 89.0 |
| Middle income | 81.9 | 80.3 | 76.0 | 69.9 | 54.9 | 58.5 | 72.9 | 76.8 |
| High income | 95.2 | 99.8 | 91.7 | 80.0 | 66.6 | 91.9 | 119.0 | 127.2 |
| Latin America: | | | | | | | | |
| Middle income | 90.5 | 94.6 | 75.5 | 59.7 | 59.3 | 90.9 | 159.4 | 141.3 |
| High income | 92.4 | 102.1 | 87.4 | 69.3 | 67.4 | 83.3 | 111.3 | 106.6 |
| Petroleum exporters | 116.3 | 126.5 | 107.0 | 213.6 | 227.6 | 264.2 | 377.6 | 395.6 |

¹ Estimated.

Sources: (11, 18).

volume exported in relation to demand. The decline in the primary product:petroleum price ratio represents a transfer of income from the developing countries to the petroleum-exporting countries.

There has been no clear trend in the net barter terms of trade indexes of primary product exports for manufactured goods and wheat. The terms of trade of primary exports for manufactured imports for the low-income

Asian and African countries appear to have declined from their 1970 values. This indicates that these countries experienced a decline in the purchasing power of their exports in terms of manufactured imports.¹⁷ Thus a higher volume of exports was required in 1978 to purchase the same volume of imports of manufactured goods as in 1970.

The high-income Asian and African countries and petroleum-exporting countries, however, improved their terms of trade of primary exports for manufactured goods compared with the 1970 values. This indicates that these countries increased the purchasing power of their exports compared with imported manufactures. The primary product:manufactures terms of trade for the middle-income Latin American and African countries appear to have declined from 1970 values during the early part of the estimation period and then increased in later years. The primary product:manufactures terms of trade for the high-income Latin American countries fluctuated from year to year.

Table 10 also shows a decline in the primary product:wheat terms of trade ratio during the early part of the estimation period for all developing countries except the petroleum-exporting countries. This result is due to exceptionally high prices for wheat experienced during the 1973-76 period. The declining primary product:wheat ratio for most countries supports the developing countries' claim that commodities exported chiefly by the developed countries (such as wheat) enjoyed stronger market conditions than those exported by developing countries (23, p. 18). More important, a decline in the purchasing power of the developing countries' primary exports in terms of wheat indicates that developing countries will have further difficulty in financing grain imports if the downward trend continues. It is important to note that the decline in the primary product:wheat price ratio was reversed in the latter part of the 1970-78 period for most countries.

Income terms of trade presented in table 11 indicate the change in foreign exchange earnings or capacity to import from 1970 values. This index takes into account volume changes as well as price changes. The indexes are calculated by multiplying the indexes of net barter terms of trade by Fisher's Ideal export volume index. When primary product prices have declined relative to manufactured goods and wheat, this decline is often

¹⁷ Although the purchasing power of exports has diminished, an increase in productivity in the exporting country could result in an increase in the purchasing power per unit of input. This is estimated as the product of the net barter terms of trade and a productivity index (double-factorial term of trade).

Table 11 — Income terms of trade, primary commodity exports
to wheat and manufactured goods imports, 1970-78

| Region and income group | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 ¹ |
|--|-------|-------|-------|-------|-------|-------|-------|-------------------|
| <i>Income terms of trade for wheat (1970 = 100)</i> | | | | | | | | |
| Africa: | | | | | | | | |
| Low income | 86.3 | 93.8 | 85.7 | 65.0 | 54.3 | 87.5 | 103.1 | 104.1 |
| Middle income | 81.5 | 91.3 | 78.4 | 69.8 | 60.9 | 84.5 | 114.5 | 112.7 |
| High income | 99.1 | 128.8 | 102.4 | 102.2 | 102.7 | 115.9 | 134.5 | 137.8 |
| Asia: | | | | | | | | |
| Low income | 97.3 | 103.1 | 70.8 | 52.9 | 63.2 | 72.9 | 89.9 | 86.4 |
| Middle income | 93.8 | 96.0 | 86.5 | 81.3 | 63.5 | 95.4 | 131.3 | 105.5 |
| High income | 90.2 | 94.9 | 99.0 | 78.1 | 65.5 | 121.7 | 136.4 | 153.0 |
| Latin America: | | | | | | | | |
| Middle income | 86.0 | 107.0 | 79.8 | 56.9 | 66.2 | 93.9 | 156.6 | 178.9 |
| High income | 88.0 | 103.1 | 87.2 | 69.0 | 66.0 | 85.2 | 119.1 | 110.8 |
| Petroleum exporters | 116.0 | 121.7 | 157.0 | 285.5 | 273.3 | 367.4 | 473.4 | 538.7 |
| <i>Income terms of trade for manufactured goods (1970 = 100)</i> | | | | | | | | |
| Africa: | | | | | | | | |
| Low income | 84.0 | 84.0 | 103.3 | 103.0 | 74.5 | 105.0 | 99.1 | 93.2 |
| Middle income | 79.4 | 81.1 | 93.9 | 110.5 | 83.6 | 110.6 | 109.6 | 100.9 |
| High income | 96.5 | 115.3 | 123.5 | 161.0 | 140.8 | 139.0 | 129.9 | 123.4 |
| Asia: | | | | | | | | |
| Low income | 94.8 | 93.1 | 85.3 | 81.5 | 85.8 | 87.5 | 86.8 | 77.3 |
| Middle income | 90.5 | 84.5 | 102.9 | 128.9 | 86.6 | 112.7 | 124.3 | 94.4 |
| High income | 87.0 | 83.5 | 118.5 | 123.7 | 90.0 | 143.8 | 129.4 | 137.0 |
| Latin America: | | | | | | | | |
| Middle income | 83.7 | 95.7 | 96.2 | 87.7 | 89.9 | 112.1 | 150.5 | 142.7 |
| High income | 85.7 | 92.3 | 105.2 | 106.9 | 90.0 | 101.7 | 114.5 | 99.2 |
| Petroleum exporters | 110.8 | 106.2 | 186.7 | 462.8 | 376.6 | 432.0 | 444.9 | 482.3 |

¹ Estimated.

offset by increased export volumes (table 11). This is particularly true for the middle-income Asian countries and, to a lesser extent, the low-income African countries and high-income Latin American countries (1975-78). A decline in the net barter terms of trade for these countries did not necessarily indicate a decline in the capacity to import during this period. The high-income African and Asian countries, and the petroleum-exporting countries appear to have improved their terms of trade as well as expanded their export volume.

Conclusions

Cocoa, coffee, sugar, rice, fishmeal, and petroleum and other minerals increased their purchasing power relative to some manufactured goods as well as to other primary commodities imported by developing countries. Other commodities—jute, tea, cotton and other fibers—declined in relative purchasing power. The differences in price trends are due to market

structures and supply and demand prospects for these commodities. The disparity in relative price increase lowered the terms of trade for low-income Asian and African countries, but enhanced the terms of trade for high-income Asian and African countries and petroleum-exporting countries.

International programs designed to increase the foreign exchange earnings of the developing countries should be commodity specific, country specific, or both. Such programs would represent a refining of the NIEO programs, which seek to raise the prices of many export products regardless of the countries that depend on their export.¹⁸ These programs also can be counterproductive because some developing countries import other developing countries' exports (especially in the case of sugar). Therefore programs that raised commodity prices for all such exports would benefit those developing countries that exported some commodities, while adding to the foreign exchange burden of other developing countries that import those commodities. Because exports of the lowest income developing countries declined the most in purchasing power, it appears that programs that alleviate the foreign exchange problems of those exports have the greatest potential benefit.

¹⁸The NIEO programs indicate that 10 core commodities are of primary interest for negotiation of commodity agreements; coffee, cocoa, copper, cotton, jute, rubber, sisal, sugar, tea, and tin. Other commodities of interest, however, are bananas, bauxite, iron ore, manganese, meat, phosphates, timber, and vegetable oils (24).

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Appendix table 1 — Country composition of regional income groups¹

| <i>Latin American countries</i> | |
|---------------------------------|--|
| Low income: | None |
| Middle income: | Bolivia, Colombia, El Salvador, Guatemala, Haiti, Honduras, Paraguay, Ecuador [†] |
| High income: | Argentina, Barbados, Belize, Brazil, Chile, Costa Rica, Dominican Republic, Guadeloupe, Guyana, Jamaica, Martinique, Mexico, Nicaragua, Panama, Peru, Surinam, Trinidad & Tobago [†] , Uruguay, Venezuela [†] |
| <i>African countries</i> | |
| Low income: | Benin, Burundi, Chad, Ethiopia, Gambia, Guinea Bissau, Malawi, Mali, Mozambique, Niger, Rwanda, Sierra Leone, Somalia, Tanzania, Upper Volta, Zaire |
| Middle income: | Angola [†] , Botswana, Cameroons, Central African Republic, Egypt, Equatorial Guinea, Ivory Coast, Kenya, Lesotho, Liberia, Madagascar, Mauritania, Morocco, Nigeria [†] , Senegal, Sudan, Togo, Uganda, Zambia |
| High income: | Algeria [†] , Gabon [†] , Libya [†] , Mauritius, Namibia, Reunion, Rhodesia, Swaziland, Tunisia [†] |
| <i>Asian countries</i> | |
| Low income: | Afghanistan, Bangladesh, Burma, India, Laos, Nepal, Pakistan, Sri Lanka |
| Middle income: | Indonesia [†] , Papua New Guinea, Philippines, South Yemen, Thailand |
| High income: | Bahrain [†] , Brunei [†] , Cyprus, Iran [†] , Iraq [†] , Jordan, Korea Rep., Kuwait [†] , Malaysia, Oman [†] , Qatar [†] , Saudi Arabia [†] , Syria [†] , Turkey, United Arab Emirates [†] |

¹Income groups are defined as follows: Low income = 0-\$200 GNP per capita, middle income = \$201-\$800 GNP per capita, high income = \$801 and up GNP per capita.

[†]Oil-exporting countries, defined as countries with at least 35 percent of commodity export earnings from petroleum.



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